-26 -25   -22 -21 -20   -8 -7 -6   -2 -1 0 1 2   6 7 8   20 21 22
25 26

Pilots

Pilots

Sub-Carrier Number →

a.) Data and Pilot Sub-Carriers

0   15   sample point @ 20 MHz   79

Cyclic Prefix –

Guard Interval

Data

FFT Processing Interval

0.0   0.8   4.0

μsecs

|← T_g →|← —————— ΔT —————— →|
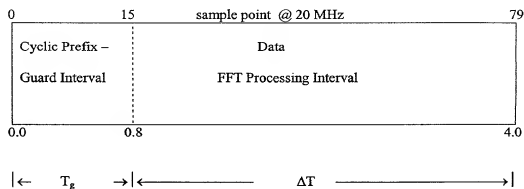
b.) OFDM Data Symbol Structure

Fig. 1 OFDM WLAN PHY Layer Data Symbols

201

|← 16 sample pts

|← 64 sample pts →|

|← 32 sample pts

0   159   319

| Short 1 | Short 2 | Short 3 | Short 4 | Short 5 | Short 6 | Short 7 | Short 8 | Short 9 | Short 10 | Long Second Half | Long First Half | Long Second Half | Long First Half | Long Second Half |

0   8.0   16.0

|← 0.8 μsecs

207 |← 1.6 μsecs

203

205

|← 3.2 μsecs →|
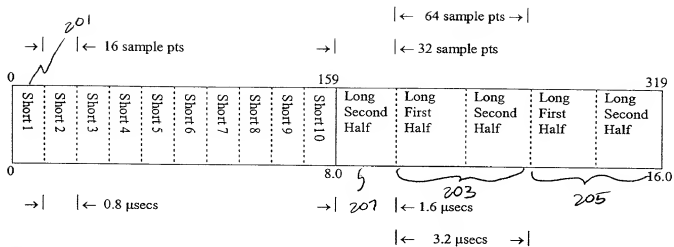
Fig. 2   OFDM WLAN Preamble Structure
(20 MHz Sample Rate)

$2^{1/2} \cdot$ { 0 , 0 , 1+j , 0 , 0 , 0 , -1+j , 0 , 0 , 0 , -1-j , 0 , 0 , 0 , 1-j , 0 , 0 , 0 , -1-j , 0 , 0 , 0 , 1-j , 0 , 0 , 0 , **0** , 0 , 0 , 0 , 1-j , 0 , 0 , 0 , -1-j , 0 , 0 , 0 , 1-j , 0 , 0 , 0 , -1-j , 0 , 0 , 0 , -1+j , 0 , 0 , 0 , 1+j , 0 , 0 , 0 }

a.) Short Sync Modulation Values - S_{-26} to S_{26}

{ 1 , 1 , -1 , -1 , 1 , 1 , -1 , 1 , -1 , 1 , 1 , 1 , 1 , 1 , 1 , -1 , -1 , 1 , 1 , -1 , 1 , -1 , 1 , 1 , 1 , 1 , **0** ,
1 , -1 , -1 , 1 , 1 , -1 , 1 , -1 , 1 , -1 , -1 , -1 , -1 , -1 , 1 , 1 , -1 , -1 , 1 , -1 , 1 , -1 , 1 , 1 , 1 , 1 }

b.) Long Sync Modulation Values - L_{-26} to L_{26}

Fig. 3 Short and Long Sync Symbol Modulation Values
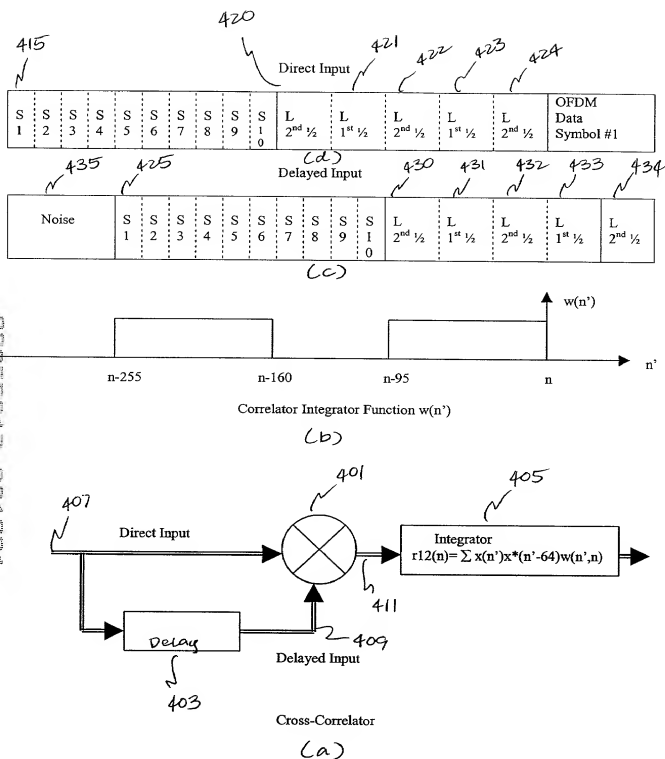
Fig. 4 Cross-correlator, preamble inputs and integrator weighting function for initial iteration of the frequency offset and timing synchronization of OFDM WLAN
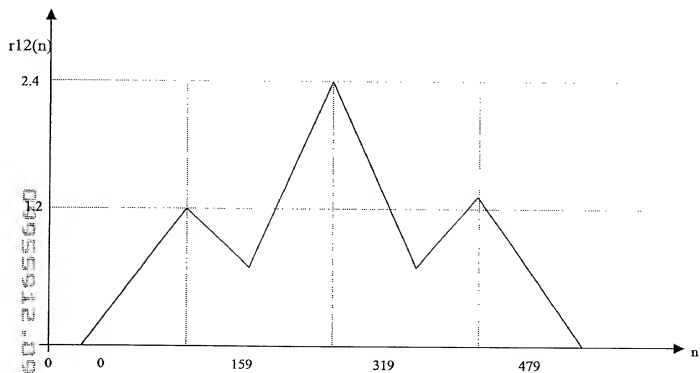
Fig. 5 Magnitude of Cross-Correlator Output versus preamble sample point number
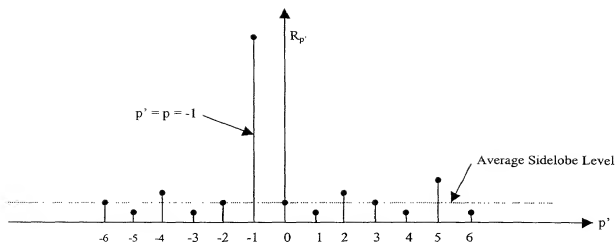
Fig. 6   Fine frequency offset correction and extraction of sub-carrier modulation values

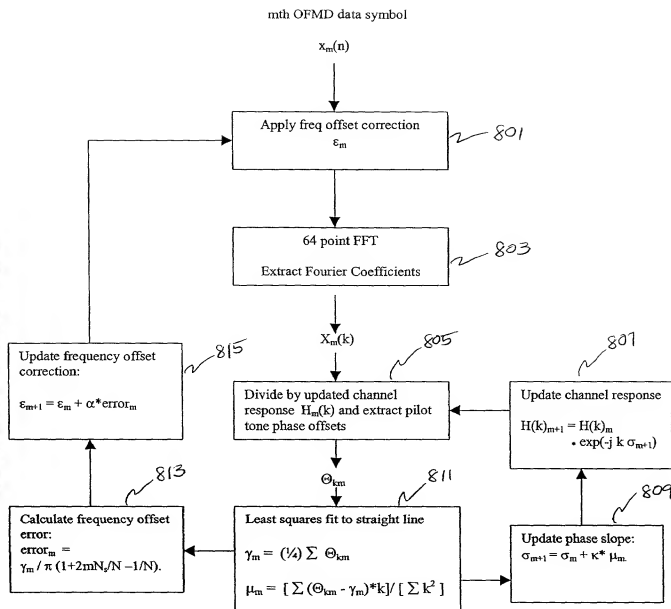Fig. 7 Correlation between interpolated and actual odd frequency channel estimates for integer frequency offset p= -1

Fig. 8 Pilot tone tracking loop